

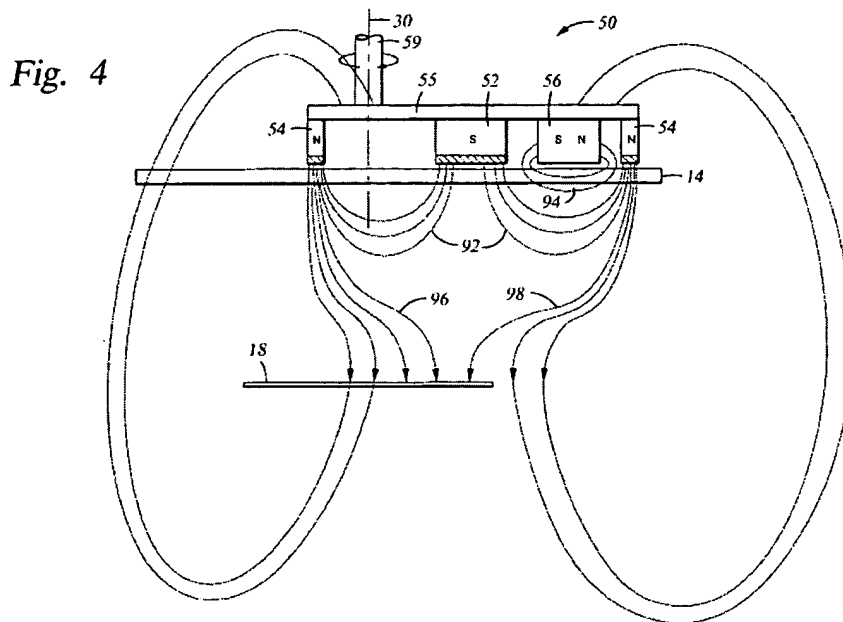
REMARKS

With the above amendments, claims 1-32 remain in the application and stand rejected. Reconsideration of the rejection is respectfully requested in light of the following reasons.

Claim Rejections -- 35 U.S.C. § 102 (Gung)

Claims 1-4, 8-10, 12-15, and 17-21 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,491,801 to Gung ("Gung"). The rejection is respectfully traversed.

Claim 1 recites an open plasma loop within a first closed plasma loop and sputtering a target with ions from the open and closed plasma loops. According to the last office action, Gung teaches a method where an "open plasma loop 94" is formed within "closed plasma loops" 96 and 98. Gung FIG. 4, cited in the last office action, is reproduced below for eased of discussion.



As shown in Gung FIG. 4, the components labeled as 94, 96, and 98 are **magnetic fields** (Gung, col. 6, line 57 to col. 7, line 21), not **plasma** loops. While plasma loops may be confined by magnetic fields, it is well known that magnetic fields are not plasma. For example, Gung discloses the effect of **magnetic fields** 96 and 98 to the **plasma** (Gung, col. 7, lines 5-9), but the magnetic fields 96 and 98 themselves are not plasma. Gung does not elaborate on plasma **loops**, if any, confined by magnetic fields 94, 96, and 98.

Gung, col. 6, line 57 to col. 7, line 21, cited in the last office action, talks about the magnetic fields 94, 96, and 98. However, that portion of Gung does not disclose or suggest formation of an open plasma loop within a closed plasma loop. That portion of Gung talks about extending the plasma, preventing plasma leakage to the chamber walls, and using plasma to guide ionized sputter atoms towards the wafer 18. However, Gung does not disclose or suggest that any of the aforementioned plasmas is a closed plasma loop confining an open plasma loop.

The ability of Gung's magnetic field 94 to form an open plasma loop is suspect given that it is generated by planar magnet 56, which is configured primarily to intensify the horizontal magnetic field close to the target 14 (Gung, col. 7, lines 17-21). That is, it appears that Gung's magnetic field 94 is not configured to create a plasma loop separate from that formed by magnetic fields 92, if any. The ability of Gung's magnetic fields 96 and 98 to form closed plasma loops is also suspect given that they extend through wafer 18.

For at least the above reasons, it is respectfully submitted that claim 1 is patentable over Gung.

Claims 2-4 and 8 depend on claim 1 and are thus patentable over Gung at least for the same reasons that claim 1 is patentable.

Claim 9 is similarly patentable over Gung. Claims 10 and 12-14 depend on claim 9 and are thus patentable over Gung at least for the same reasons that claim 9 is patentable.

Claim 15 is patentable over Gung at least for reciting: “sputtering the target with ions of an **open plasma loop**” (emphasis added). Gung, FIG. 6, cited in the last office action, is reproduced below for ease of discussion.

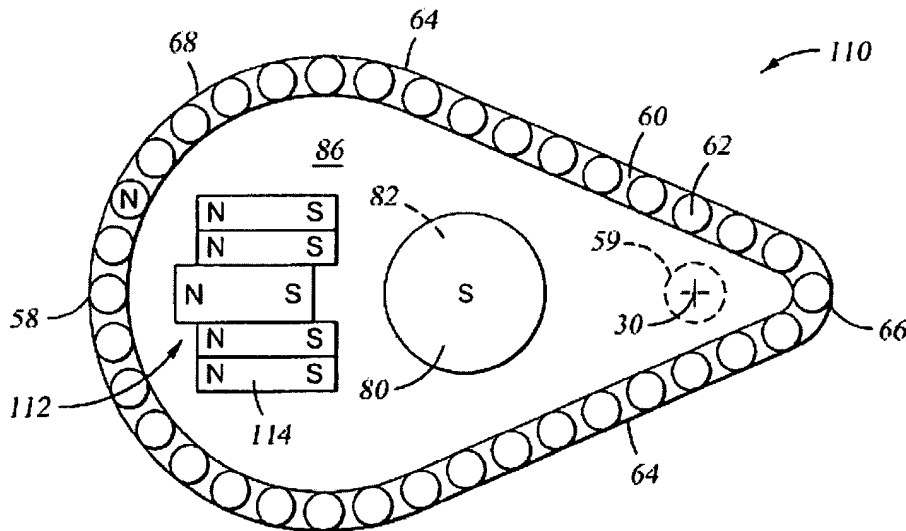


Fig. 6

Referring to Gung FIG. 6, whether or not plate magnets 114 can form an open plasma loop does not depend merely on the orientation of magnets 114, but also on magnetic fields interacting with those of magnets 114 and the magnetic structures in the vicinity of magnets 114. It appears that magnets 114 are configured to provide the same effect as planar magnet 56 (Gung, col. 7, lines 30-56). If so, the magnets 114 is configured primarily to intensify the horizontal magnetic field close to the target 14 and not to form a separate plasma loop, if any.

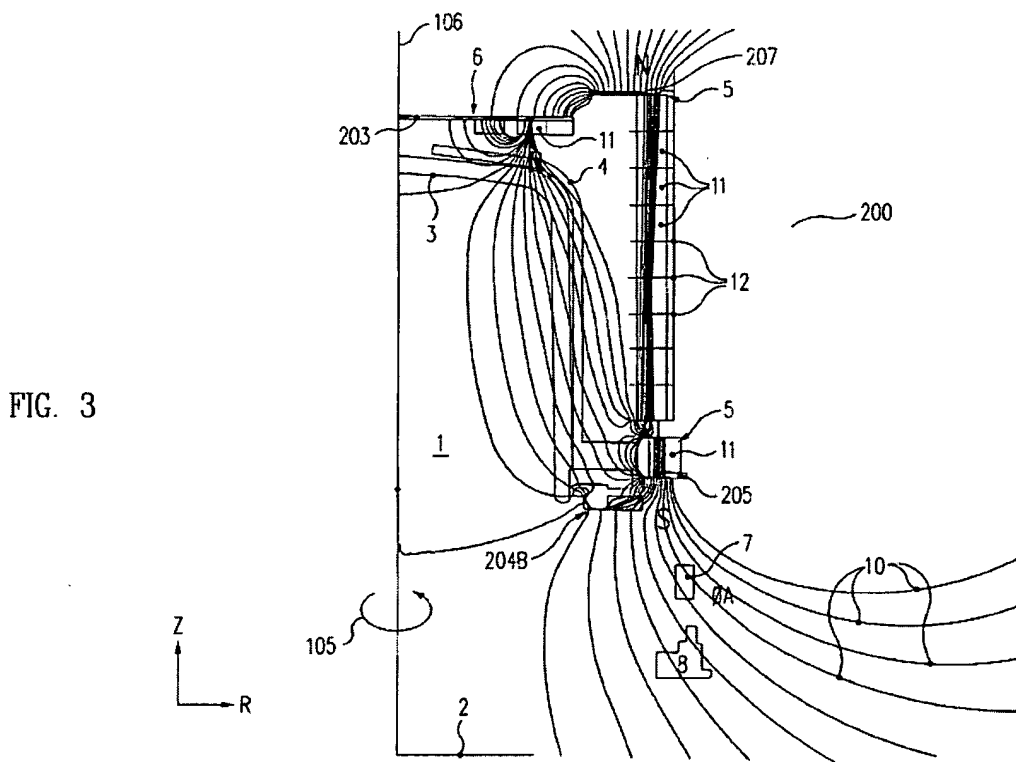
For at least the above reasons, it is respectfully submitted that claim 15 is patentable over Gung.

Claims 17-21 depend on claim 15 and are thus patentable over Gung at least for the same reasons that claim 15 is patentable.

Claim Rejections -- 35 U.S.C. § 102 (Lai)

Claims 26-36 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,179,973 to Lai et al. ("Lai"). The rejection is respectfully traversed.

Claim 26 is patentable over Lai at least for reciting: "forming a closed plasma loop" and "the first open plasma loop having a beginning on a path defined by the closed plasma loop and an end on a region of the chamber." Lai FIG. 3, cited in the last office action, is reproduced below for ease of discussion.



Lai FIG. 3 shows the **magnetic fields** of its magnets, no **plasma** loops. Lai, col. 5, line 56 to col. 6, line 18, which discusses FIG. 3, is also silent as to plasma loops. It is respectfully submitted that magnetic fields may confine or shape plasma but magnetic fields are NOT plasma. For example, Lai discloses using magnetic fields to maintain a high density plasma (Lai, col. 2, lines 61-65), but the magnetic fields are certainly not plasma.

Therefore, claim 26 is patentable over Lai. Claims 27-32 depend on claim 26 and are thus patentable over Lai at least for the same reasons that claim 26 is patentable.

Claim Rejections -- 35 U.S.C. § 102 (Kastanis)

Claims 22, 23, and 25 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,432,285 to Kastanis et al. ("Kastanis"). The rejection is respectfully traversed. Kastanis FIG. 6, cited in the last office action, does not show a separatrix or any magnetic field line. Kastanis FIG. 3, which shows the magnetic fields of Kastanis' magnetron assembly, is more instructive and thus reproduced below for ease of discussion.

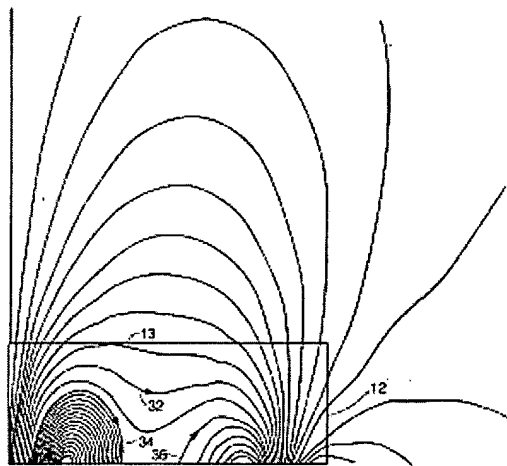


FIG. 3

Kastanis pertains to the formation of magnetic lobes in a magnetron apparatus (Kastanis, col. 4, lines 40-45). Each of the magnetic lobes is separate and confines a plasma. In Kastanis FIG. 3, the three magnetic lobes are labeled as 32, 34, and 36. These magnetic lobes are closed loop for target sputtering. Kastanis does not disclose or suggest that any of these lobes have a null region through which ions may escape to be deposited on a substrate. This is not surprising given that Kastanis does not pertain to the use of a separatrix to control plasma flow to the substrate. From Kastanis' disclosure, it appears that the magnetic lobes are closed loop to keep the plasma in for sputtering the target

(Kastanis, col. 8, lines 9). Kastanis does not disclose or suggest that plasma confined by the magnetic lobes escape through a null region. Kastanis does not even disclose or suggest formation of a null region.

For at least the above reasons, it is respectfully submitted that claim 22 is patentable over Kastanis. Claims 23 and 25 depend on claim 22 and are thus patentable over Kastanis at least for the same reasons that claim 22 is patentable.

Claim Rejections -- 35 U.S.C. § 103 (Gung and Lai)

Claims 1, 5-7, 9, 11, 15, and 16 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Gung in view of Lai.

The patentability of claims 1, 9, and 15 over Gung has already been explained above. Lai does not add to Gung in regard to claims 1, 9, and 15. Claims 5-7 depend on claim 1, claim 11 depends on claim 9, and claim 16 depends on claim 15. Therefore, it is respectfully submitted that claims 5-7, 9, 11, and 16 are patentable over Gung and Lai at least for the same reasons their respective base claims are patentable.

As noted in the last office action, Gung does not disclose hollow cathode targets and a separatrix. Lai does disclose a hollow cathode target and a separatrix. However, while a hollow cathode target and a separatrix in a general sense are not new, the implementation of such features in claims 5-7, 11, and 16 is heretofore not available in the prior art. For example, claims 6 and 7 claim particular configurations of a separatrix NOT disclosed or suggested in Lai. That is, Lai does not disclose or suggest separatrix configurations that result in the formation of an open plasma loop.

Claim Rejections -- 35 U.S.C. § 103 (Kastanis and Lai)

Claims 22 and 24 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Kastanis in view of Lai.

The patentability of claim 22 over Kastanis has already been explained above. Lai does not add anything to Kastanis in regard to claim 22. Claim 24 depends on claim

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22 and is thus patentable over Kastanis and Lai at least for the same reasons that claim 22 is patentable.

As noted in the last office action, Kastanis does not disclose the use of a hollow cathode magnetron. While Lai does disclose a hollow cathode magnetron, neither Lai nor Kastanis discloses or suggests that a hollow cathode magnetron may be used with Kastanis' three separate magnetic lobes.

Conclusion

For at least the above reasons, it is believed that claims 1-32 are in condition for allowance. The Examiner is invited to telephone the undersigned at (408)436-2112 for any questions.

If for any reason an insufficient fee has been paid, the Commissioner is hereby authorized to charge the insufficiency to Deposit Account No. 50-2427.

Respectfully submitted,
Daniel R. Juliano, et al.

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Patrick Benedicto

Patrick D. Benedicto, Reg. No. 40,909
Okamoto & Benedicto LLP
P.O. Box 641330
San Jose, CA 95164
Tel.: (408)436-2110
Fax.: (408)436-2114

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